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EXAMINER	
BERNATZ, KEVIN M	
ART UNIT	**PAPER NUMBER**
1773	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

JW

Office Action Summary	**Application No.** 10/679,419	**Applicant(s)** LEE ET AL.
	Examiner Kevin M Bernatz	**Art Unit** 1773

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21 and 23-26* is/are pending in the application.

4a) Of the above claim(s) *10-16,18,20 and 21* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,17,19 and 23-26* is/are rejected.

7)☒ Claim(s) *4,7,9 and 26* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Amendments to the specification and claims 1, 4 – 6, 8, 9, 17 and 19, and addition of claims 23 - 26, filed on January 18, 2005, have been entered in the above-identified application.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Examiner's Comments

3. The Examiner notes that amorphous polymers generally do not have what is traditionally called a "softening temperature", since a softening temperature is equated with a crystalline material (i.e. a solid) melting sufficiently to exhibit flow (i.e. a liquid material). All polymers will exhibit some degree of softening at their glass "transition" temperature[1] and for the purpose of evaluating the prior art the Examiner has taken that any amorphous thermoplastic polymer material having a glass temperature as low as about 95 °C will meet the claimed "softening" limitation. See Modern Plastics Handbook, chapter 5.1.1 for further clarification.

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[1] The Examiner notes that technically the "glass transition temperature" is a misnomer, since the glass temperature is actually a kinetic event and no material "transition" actually occurs. However, the Examiner notes that the phrase has obtained wide spread use and the meaning is clear to anyone skilled in the art. If further information is desired, applicants are pointed to the Examiner's PhD Thesis on the subject: "Viscoelastic Properties of Inorganic Glasses", Univ. of Pittsburgh, 1999, published by UMI.

Claim Objections

4. Claims 4 and 9 are objected to because of the following informalities: "Ru" is listed twice and the second listing should be deleted (the Examiner notes that the specification also contains the same duplicate listing). Appropriate correction is required.

5. Claims 7 and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1 – 9, 17, 19 and 23 – 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 – 9, 17, 19 and 23 – 26 recite the limitation "as low as about 95 °C", which is confusing because it has at least 2 interpretations.

i) the glass transition temperature must be *about 95 °C*, where the clause "as low as" is merely indicating that applicants believe 95 °C is a low temperature; or

ii) the glass transition temperature is *less than or equal to 95 °C*, where the phrase "as low as" implies that the glass transition temperature should be no higher than 95 °C; or

iii) the glass transition temperature is *greater than or equal to 95 °C*, where the phrase "as low as" is giving the lowest acceptable value for the glass transition temperature.

For the purpose of evaluating the prior art, the Examiner has taken the position that the intent of the claimed limitation is interpretation (iii) above. The Examiner notes that this is consistent with applicants' as-filed disclosure (*page 15 of specification*) and is the same interpretation that Examiner Uhlir appears to have taken in the prior office action (which applicants have not argued against). However, to clarify the record and to remove any confusion in the claims, the Examiner recommends rewording the language "as low as about 95 °C" to "greater than about 95 °C" in the claims and/or specification.

Claim 7 recites the limitation "at least one non-magnetic underlayer" in line 2. There is insufficient antecedent basis for this limitation in the claim. The Examiner notes that this appears to be a typo and that the language should recite "at least one non-magnetic *inter*layer", which is how the claim has been interpreted for the purpose of evaluating the prior art.

Claim Rejections - 35 USC § 103

8. Claims 1 – 5, 17, 19 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (U.S. Patent App. No. 2004/0000374 A1) in view of Oyanagi et al. (U.S. Patent No. 6,066,380), Kubota et al. (U.S. Patent App. No. 2002/0058159 A1) and applicants' admissions.

Regarding claims 1, 17 and 23, Watanabe et al. disclose a perpendicular magnetic recording medium (*Paragraph 0008*), comprising (a) a substrate of a thermoplastic polymer (*Paragraph 0018*); and (b) at least one stack of thin film layers formed on at least one surface of said substrate (*Paragraph 0017 and Figures*), said at least one layer stack including at least one granular magnetic recording layer of perpendicular type (*Paragraph 0023*); wherein the Hc of said perpendicular magnetic recording medium is at least about 4000 Oe (*Table 1*), and said at least one layer stack includes at least one soft magnetic underlayer (*Paragraphs 0020 – 0021 and Figures*).

Regarding claim 17, the limitation(s) "wherein each of said thin film layers of said stack is formed by depositing at a substrate temperature not greater than 70 °C" is a process limitation(s) and is/are not further limiting in terms of the structure resulting from the claimed process. Specifically, in a product claim, as long as the prior art product meets the claimed structural limitations, the method by which the product is formed is not germane to the determination of patentability of the product unless an unobvious difference can be shown to result from the claimed process limitations. In the instant case, the Examiner notes that Watanabe et al. clearly disclose using low temperature heating (*Paragraph 0018*), and hence the disclosed product is deemed to be substantially identical in structure resulting from the method of production.

Watanabe et al. fail to explicitly disclose using a substrate of an amorphous thermoplastic polymer material having a softening and glass transition temperature as low as about 95 °C.

However, Oyanagi et al. teach, and applicants' admit, that such materials are preferably used for recording media substrates since they allow for excellent heat resistance, precision moldability, low moisture absorption and are readily available and economically affordable (*Oyanagi et al., col. 3, lines 40 – 43 and col. 4, lines 13 – 63; and applicants' specification, page 15, lines 7 – 15*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Watanabe et al. to utilize a substrate meeting applicants' claimed material limitations as taught by Oyanagi et al. and as admitted by applicants, since such a substrate allows for excellent heat resistance, precision moldability, low moisture absorption and are readily available and economically affordable.

None of the above disclose using a soft magnetic layer comprising FeCoB.

However, teach that FeCoB soft magnetic layers are particularly preferred compared to traditional soft magnetic layers (i.e. NiFe, CoZrNb, etc) for perpendicular magnetic recording media since such a material possesses high saturation magnetization and can provide extremely smooth surfaces and radial orientation without the need for additional processing (*Paragraphs 0004 - 0012*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Watanabe et al. to utilize a soft magnetic underlayer comprising FeCoB as taught by Kubota et al., since such a layer possesses high saturation magnetization and can provide extremely smooth surfaces and radial orientation without the need for additional processing.

Regarding claims 2 and 3, Watanabe et al. disclose substrates meeting applicants' claimed material limitations (*Paragraph 0018*).

Regarding claims 4, 5 and 19, Watanabe et al. as modified above disclose a soft magnetic underlayer, at least one non-magnetic interlayer meeting the claimed material limitations (*elements 2 and 12 and Paragraphs 0019 and 0020*), a granular magnetic layer meeting the claimed material limitations (*Paragraphs 0023 – 0024 and Examples*), and a protective overcoat comprising carbon (*Paragraph 0026*). Kubota et al. teach providing a combined seed/adhesion layer meeting applicants' claimed structural and material limitations to facilitate adhesion of the soft magnetic layer to the substrate (*Paragraph 0027*).

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. in view of Oyanagi et al., Kubota et al. and applicants' admissions as applied above, and further in view of Sugita et al. (U.S. Patent No. 4,687,712), Fujimura et al. (U.S. Patent No. 5,466,308), Platt et al. (IEEE Trans. Mag., 37(4), 2001, 2302 – 2304), and Kraus et al. (IEEE Trans. Mag., 30(2), 1994, 530 – 532).

Watanabe et al., Oyanagi et al., Kubota et al. and applicants' admissions are relied upon as described above.

None of the above disclose a combined seed/adhesion layer comprising Ti or a silicon nitride/Cr bi-layer.

However, Sugita et al. teach a Ti adhesion layer for use under a soft magnetic layer for improving the perpendicular orientation of the recording medium (*Figure 10 and col. 5, lines 55 – 67*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Watanabe et al. in view of Oyanagi et al., Kubota et al. and applicants' admissions to utilize a Ti seed/adhesion layer as taught by Sugita et al., since such a combined seed/adhesion layer results in improved perpendicular orientation of the recording medium.

Regarding the limitation "said at least one soft magnetic underlayer comprising FeCoB comprises $FeCo_{30.6}B_{12.5}$", Fujimura et al. (*Figures and Examples*), Kraus et al. (*entire disclosure*) and Platt et al. (*entire disclosure*) teach the amount of each component in a soft magnetic FeCoB alloy can be varied to effect the soft magnetic properties in the alloy, and that an alloy having ~12% Boron exhibits an excellent combination of low coercivity and high magnetization. Therefore, the Examiner deems that it would have been obvious to one having ordinary skill in the art to determine an amount of Fe, Co and B meeting applicants' claimed composition by optimizing the results effective variable through routine experimentation. *In re Boesch*, 205 USPQ 215 (CCPA 1980); *In re Geisler*, 116 F. 3d 1465, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *In re Aller*, 220 F.2d, 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Regarding the limitation "said at least one granular perpendicular hard magnetic recording layer comprises $CoPt_{18}$", the Examiner notes that while Watanabe et al. does not explicitly teach an alloy having 18% platinum, Watanabe et al. does teach CoPt alloys as being particularly preferred, including examples utilizing 17% platinum (*Paragraphs 0023 and 0029*). As such, the Examiner deems that the amount of platinum used in the CoPt alloy is a results effective variable in terms of the magnetic properties of the layer and that the claimed 18% platinum alloy would have been obvious to one of ordinary skill in the art, especially given the extreme similarity to the 17% platinum alloy utilized in the Watanabe et al. example.

10. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. in view of Oyanagi et al., Kubota et al. and applicants' admissions as applied to claim 1 above, and further in view of Sugita et al. ('712).

Watanabe et al., Oyanagi et al., Kubota et al. and applicants' admissions are relied upon as described above.

None of the above disclose a combined seed/adhesion layer comprising Ti or a silicon nitride/Cr bi-layer, nor a plurality of stacked soft magnetic underlayer/wetting layers meeting applicants' claimed limitations.

However, Sugita et al. teach a Ti adhesion layer for use under a soft magnetic layer for improving the perpendicular orientation of the recording medium (*Figure 10 and col. 5, lines 55 – 67*), as well as a plurality of stacked soft magnetic underlayer/wetting layer pairs meeting applicants' claimed material and structural limitations for increasing the reproduction output of a perpendicular recording medium (*Figures; col. 2, lines 11 – 17; and col. 3, lines 31 – 35*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Watanabe et al. in view of Oyanagi et al., Kubota et al. and applicants' admissions to utilize a Ti seed/adhesion layer and a plurality of stacked soft magnetic underlayer/wetting layers meeting applicants' claimed limitations as taught by Sugita et al., since such limitations results in improved perpendicular orientation of the recording medium and increased reproduction output.

11. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. in view of Oyanagi et al., Kubota et al. and applicants' admissions as applied to claim 17 and 23 above, and further in view of Fujimura et al. ('308), Platt et al. (IEEE Trans. Mag., 37(4), 2001, 2302 – 2304), and Kraus et al. (IEEE Trans. Mag., 30(2), 1994, 530 – 532).

Watanabe et al., Oyanagi et al., Kubota et al. and applicants' admissions are relied upon as described above.

Regarding the limitation "said at least one soft magnetic underlayer comprising FeCoB comprises $FeCo_{30.6}B_{12.5}$", Fujimura et al. (*Figures and Examples*), Kraus et al. (*entire disclosure*) and Platt et al. (*entire disclosure*) teach the amount of each component in a soft magnetic FeCoB alloy can be varied to effect the soft magnetic properties in the alloy, and that an alloy having ~12% Boron exhibits an excellent combination of low coercivity and high magnetization. Therefore, the Examiner deems that it would have been obvious to one having ordinary skill in the art to determine an amount of Fe, Co and B meeting applicants' claimed composition by optimizing the results effective variable through routine experimentation.

Allowable Subject Matter

12. Claims 7 and 26 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record fails to teach or render obvious a non-magnetic interlayer comprising a first and second Ru layer wherein the first Ru layer is adjacent to said soft magnetic underlayer and formed to a less thickness than said second Ru layer in a lower inert gas pressure atmosphere than that utilized for said second Ru layer.

Response to Arguments

13. The prior rejection of claims 1 – 5, 8, 9 and 22 under 35 U.S.C § 103(a) – Uwazumi et al. in view of various references

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Nakamura et al. (U.S. Patent App. No. 2002/0028355 A1) and

Koda et al. (U.S. Patent No. 6,866,948 B2) teach a perpendicular magnetic recording medium utilizing 2 Ru layers between the soft magnetic layer and the upper-most perpendicular recording layer, but fail to teach or render obvious the specific limitations in claims 7 and 26. Carey et al. (U.S. Patent No. 2003/0022023 A1) and Shukh et al. (U.S. Patent App. No. 2002/0028357 A1) teach a perpendicular recording medium utilizing a granular CoPt alloy magnetic layer over a CoFeB laminated soft magnetic layer, but does not explicitly disclose coercivity values or substrate materials meeting applicants' claimed limitations. Shimizu et al. (U.S. Patent App. No. 2002/0127433 A1) and Ikeda (U.S. Patent App. No. 2001/0019786 A1) teach granular perpendicular magnetic recording media over laminated soft magnetic layers, but fail to explicitly teach using CoFeB. The Examiner notes that Ikeda ('786 A1) also teaches polymeric substrates.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
March 29, 2005

Kevin M. Bernatz, PhD
Primary Examiner